Study 1
Lightweight Materials

OBJECTIVES

- Identify current radiator coatings and structural materials used on space hardware
- Identify cutting edge materials in these areas
- Identify tests and simulations needed to increase the CRL of newer materials
- Support work needed with documented references and contacts

FOCUS AREAS

- Structural Materials
  - Metals
  - Metallic based composites
  - Polymer / carbon based composites
  - Carbon nanotube composites
- Radiator Coatings
  - Low temperature coatings
  - High temperature coatings

CONCLUSIONS

- Structural Materials
  - Moving steadily from metals to composites
  - ~15 years from cradle to flight for new materials
  - A defined application ⇒ best chance of success for of new material
  - Significant weight savings available in secondary structures – lower requirement hurdles
  - Decrease prototype & manufacturing costs key for greater composite use
  - Metal Matrix Composites are underutilized
  - Carbon nanotube composites show great promise
- Radiator Materials
  - Dust management is key to Lunar applications

RECOMMENDATIONS

1. Use Al-Be alloys in manned environment by resolving health issues
2. Identify candidate hardware for MMCs
3. Assess potential development of Al laminate using XRF1
4. Assess application of ALONtm for surface suit face shields
5. Assess improved FRPC matrix behavior through small % addition of carbon nanotubes
6. Develop new radiator coating
7. Develop Lunar/Mars dust removal device compatible with coating